

Passivhaus Standard: The Next Step for High Performance Schools

Presented by Adam J. Cohen, CPHC NA & EU, LEED AP



PASSIVHAUS : THE NEXT STEP FOR HIGH PERFORMANCE SCHOOLS
High Performance Sustainable School Buildings Workshop
Lexington, Kentucky



What is Passivhaus?

Passive House Verification



Bldg Name	End-of-Terrace Passive House Kranichstein		
Location and Climate	Darmstadt-Kranichstein		
Year of Construction	1991		
Number of Dwelling Units	1	Indoor Temperature	20.0 °C
Enclosed Volume V _e	665.0 m ³	Internal Heat Sources	2.1 W/m ²
Number of Occupants	4.0		

Specific requirements with relevance to the treated floor area

Enveloped Floor Area	156.00 m ²	Applied:	Annual Method	PM Certificate:	net?
Specific Space Heat Requirement:	14 kWh/(m ² ·a)			15 kWh/(m ² ·a)	✓
Pre certification Test Result:	0.22 h ⁻¹			0.6 h ⁻¹	✓
Specific Primary Energy Requirement (DIN, heating, a.s., & household electricity):	61 kWh/(m ² ·a)			120 kWh/(m ² ·a)	✓
Specific Primary Energy Requirement (DIN, heating and auxiliary electricity):	36 kWh/(m ² ·a)				
Specific Primary Energy Requirement (DIN, heating and auxiliary electricity):	33 kWh/(m ² ·a)				
Heat Load:	10.1 W/m ²				

Passive House Requirements

Annual heating demand
Annual cooling demand
(net floor area)

≤ 15
kWh/m²

≤ 1.4
kWh/ft²

Annual total primary
energy demand
(net floor area)

≤ 120
kWh/m²

≤ 11.1
kWh/ft²

Air leakage @ 50 P

N⁵⁰ ≤ 0.6
ACH

N⁵⁰ ≤ 0.6
ACH

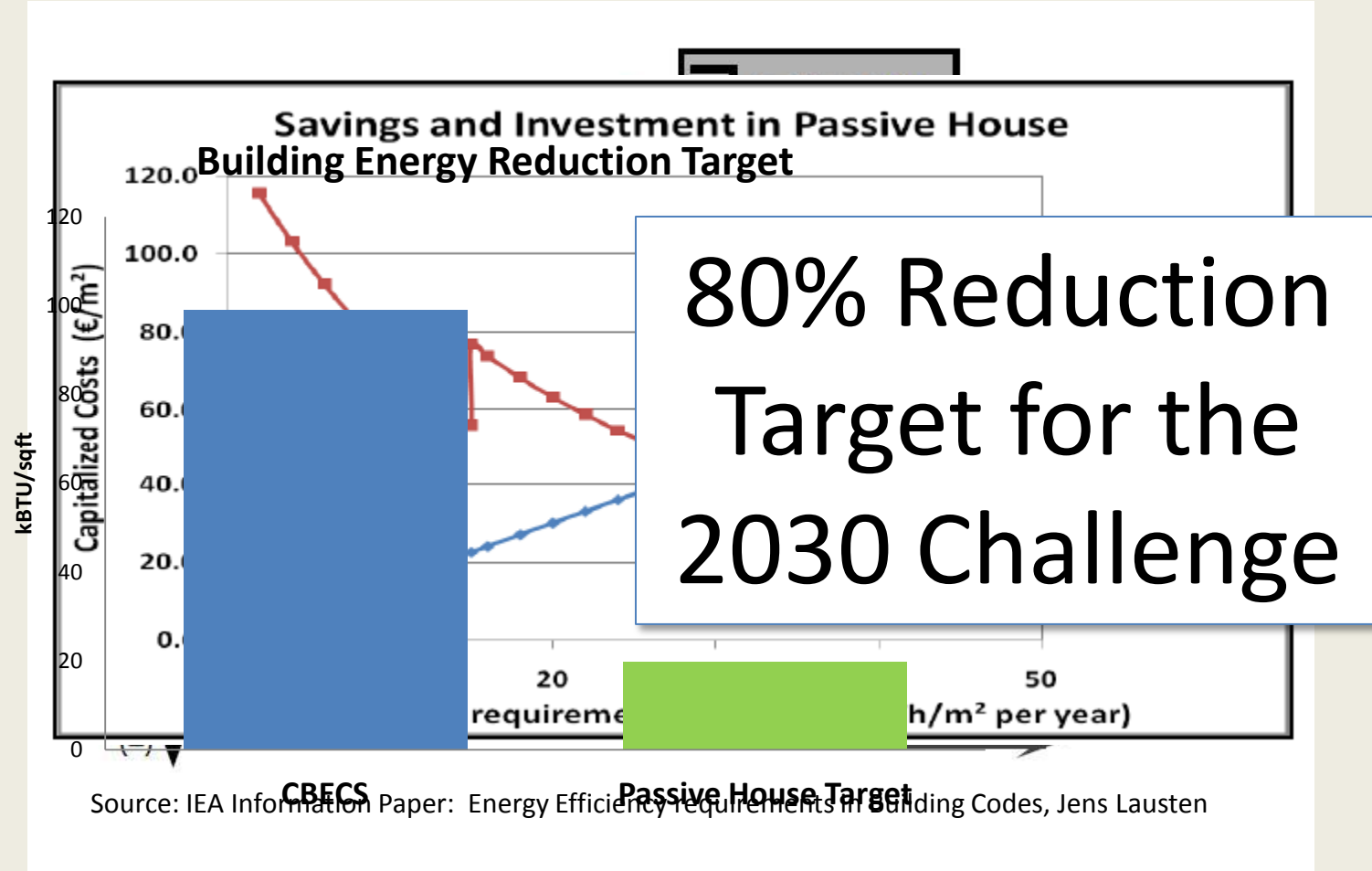
**Simple, clearly defined and
verifiable parameters**



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Rational for Passive House Metrics



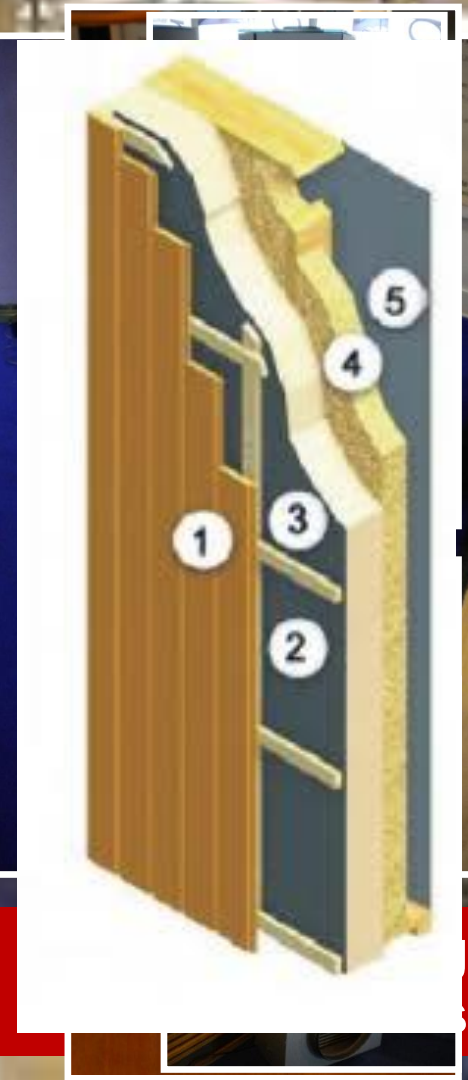
Graph from 'Natural Capitalism' by Paul Hawkins, Amory Lovins, and L. Hunter Lovins



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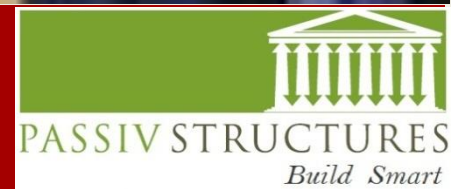


Passivhaus: *Innovate and Prosper*



Groundbreaking building systems

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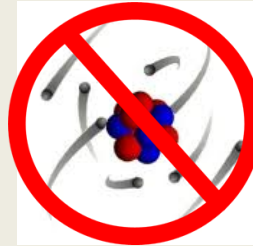


Passivhaus: *Residential is different*

Residential Passivhaus delivered for cost parity with standard construction



Simple choice - Pay for electrons or equity



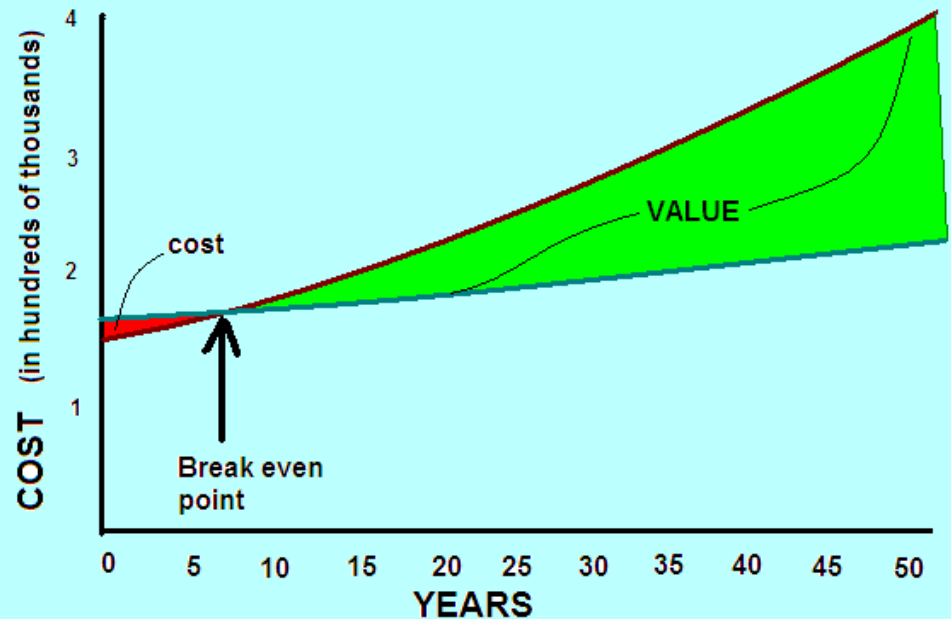
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ROI

ITS ALL ABOUT
RETURN ON
INVESTMENT



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Hickory Hall
Under

Elm Hall
Completed

Hickory Hall

Emory and Henry College

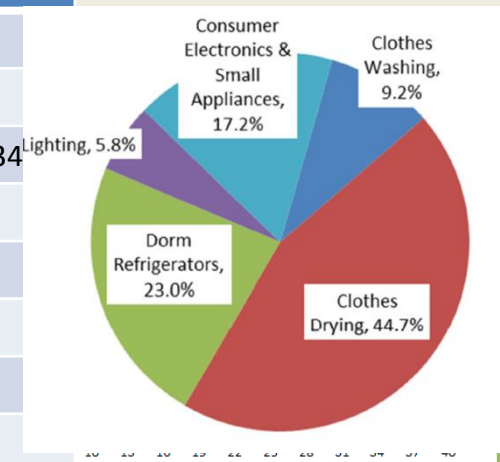
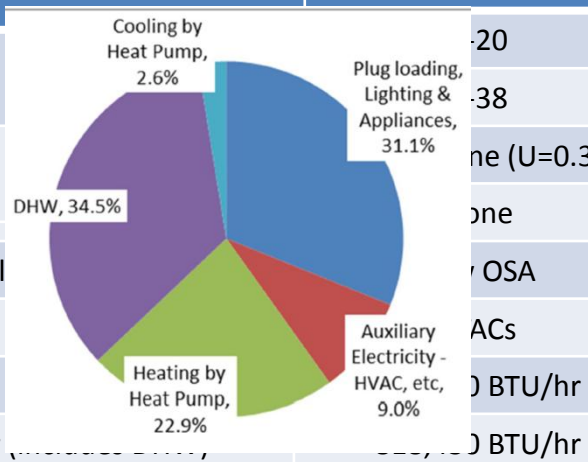
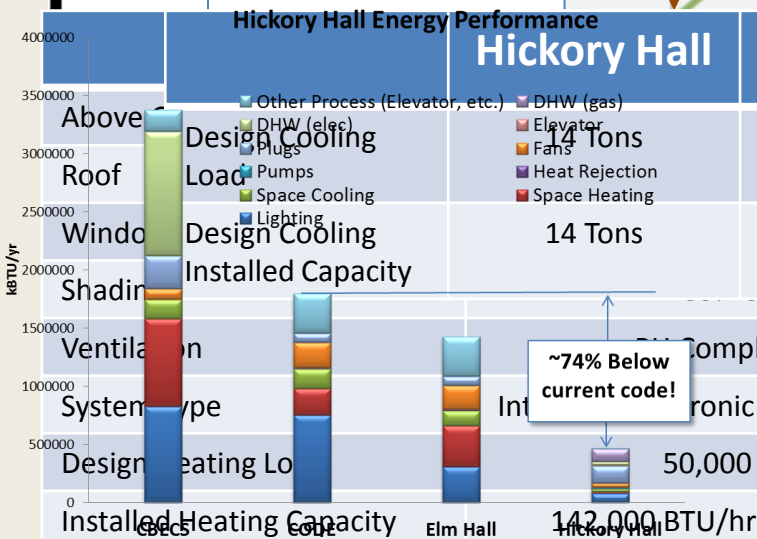
Building Type: Dormitory

Size: 3,716 m²
40,000 ft²

Passivhaus Investment: € 174,156
\$ 230,000

Cost / kWh € 0.876
(US average) \$ 0.1153

Energy Inflation: 2.0%



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Malcolm Rosenberg Center for Jewish Life

Virginia Polytechnic University

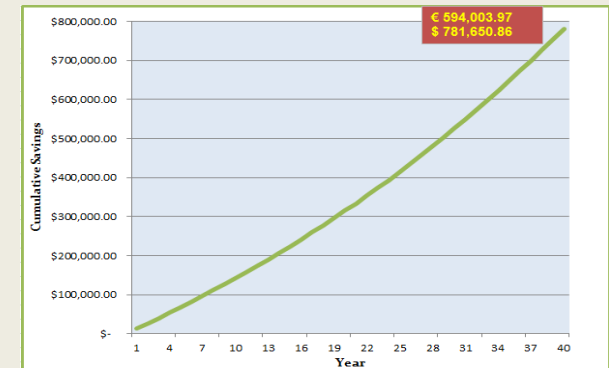
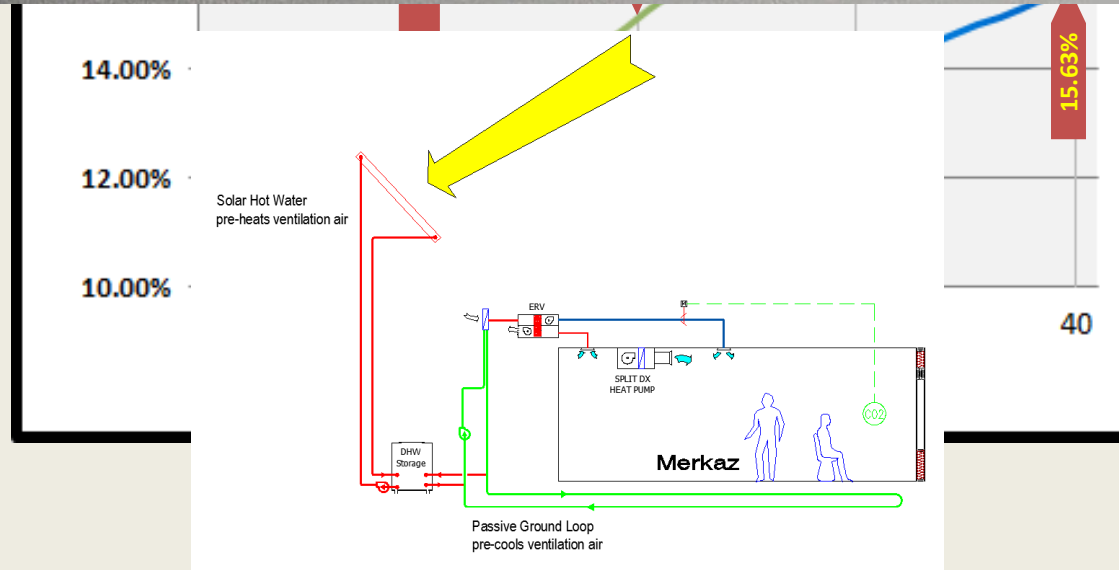
Building Type: Mixed Use
Student Center

Size: 744 m²
8,000 ft²

Passivhaus Investment: € 94,650
\$ 125,000

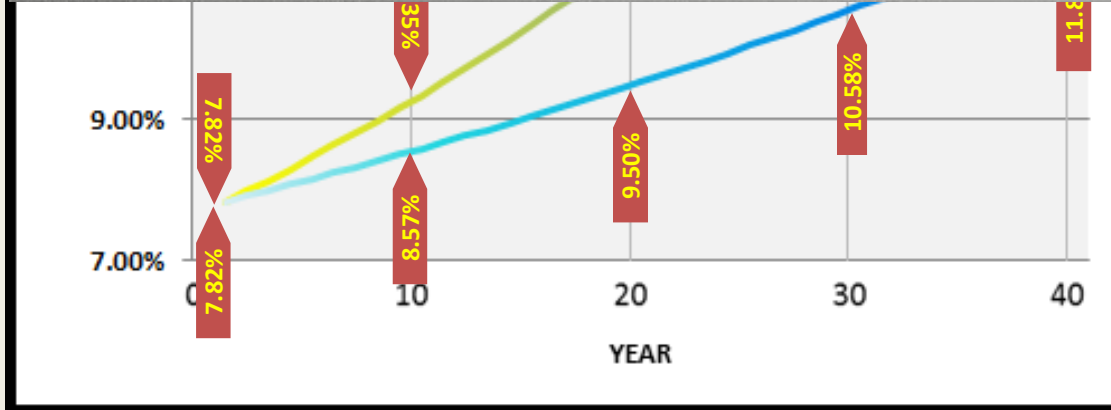
Cost / kWh (US average): € 0.876
\$ 0.1153

Energy Inflation: 2.0%
(US 30 yr average)



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New Office for Dr.s Lynch, Dickey & Singleton

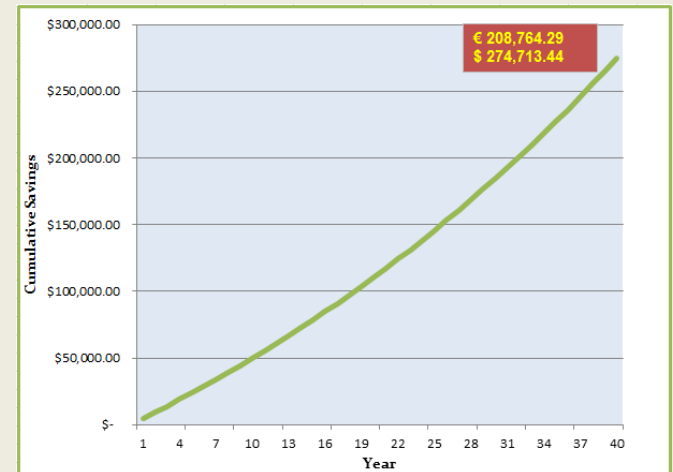
Building Type: Dental Office

Size: 465 m²
5,000 ft²

Passivhaus Investment: € 44,182
\$ 58,139

Cost / kWh € 0.876
(US average) \$ 0.1153

Energy Inflation: 2.0%
(US 30 yr average)



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Center for Energy Efficient Design

Franklin County, Virginia

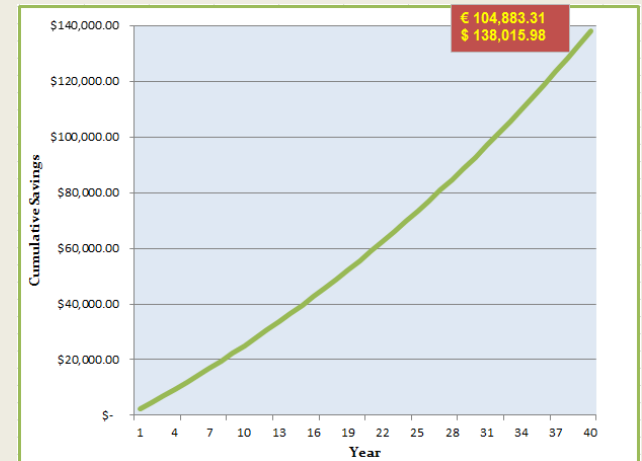
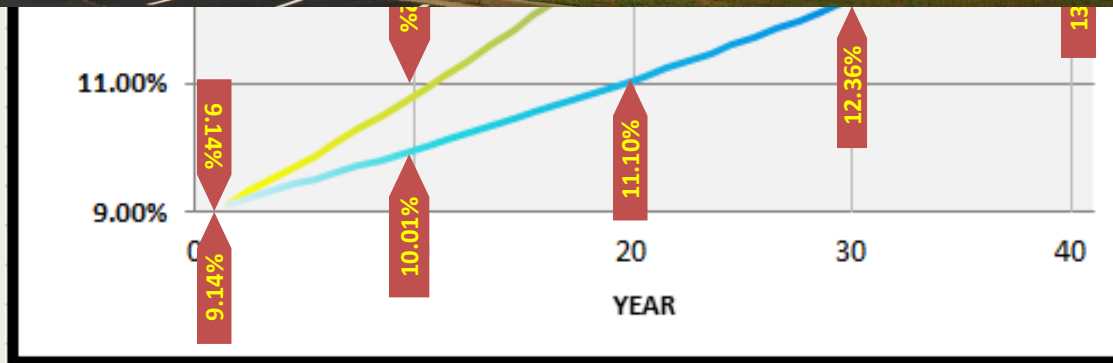
Building Type: Public School

Size: 334 m²
3,600 ft²

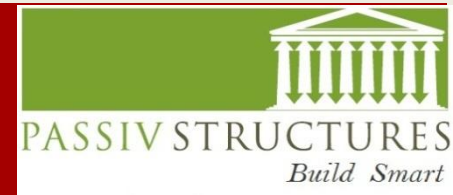
Passivhaus Investment: € 18,930
\$ 25,000

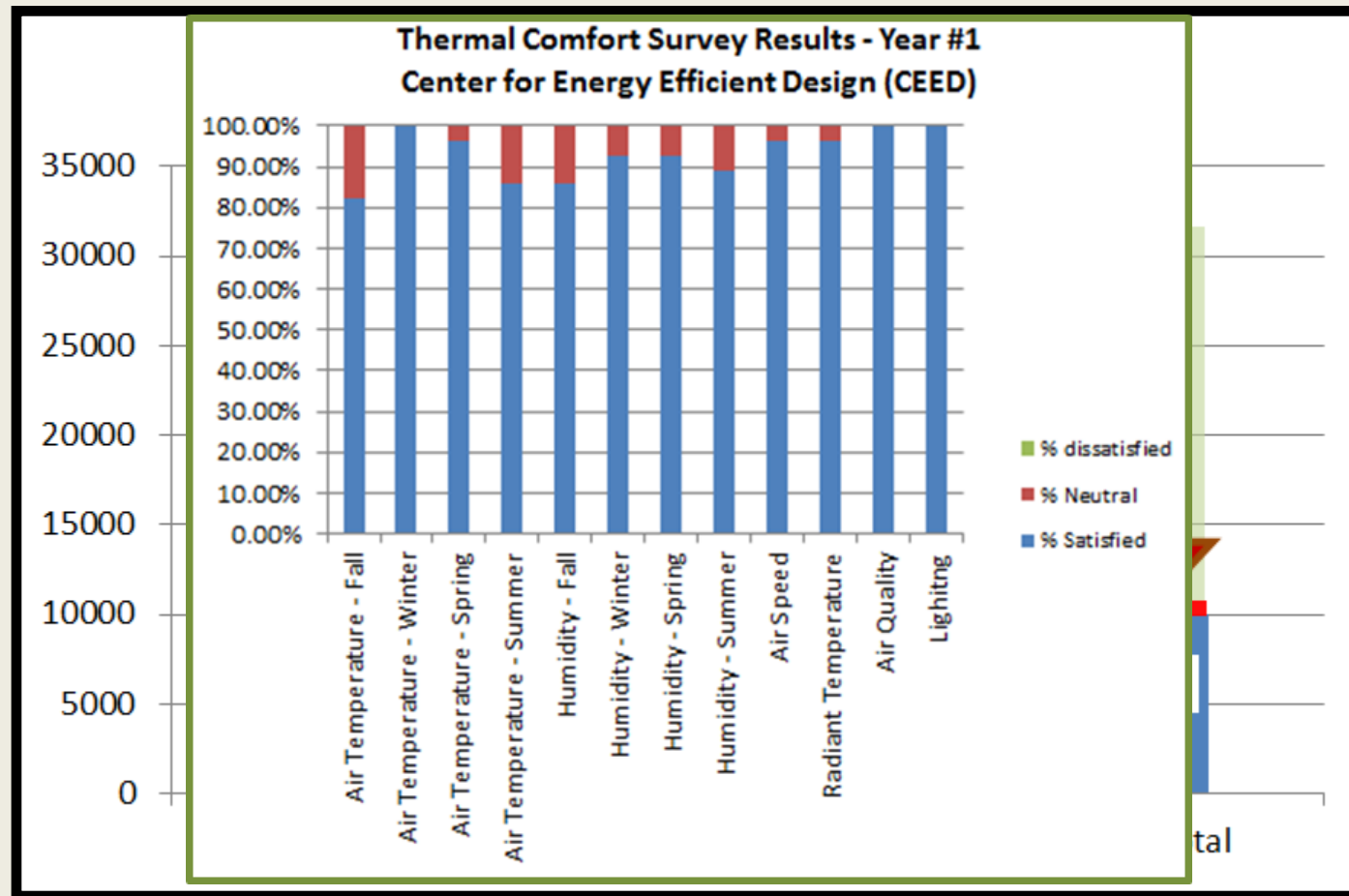
Cost / kWh € 0.876
(US average) \$ 0.1153

Energy Inflation: 2.0%
(US 30 yr average)



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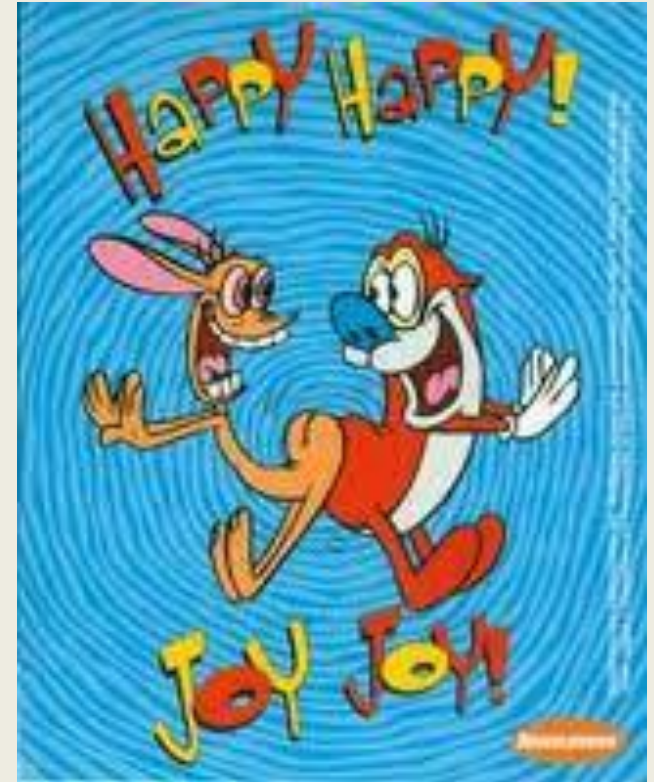
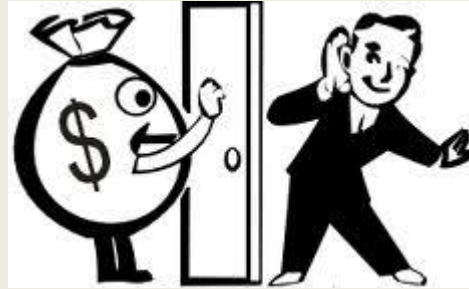




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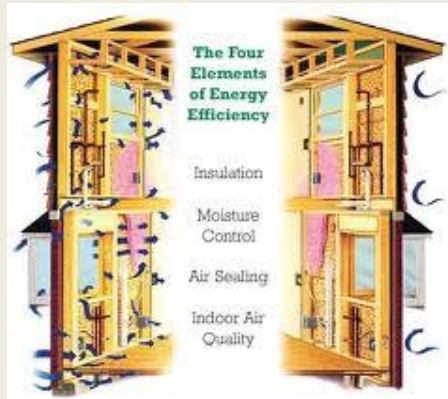
Commercial Passivhaus **Ready**, Steady, GO!



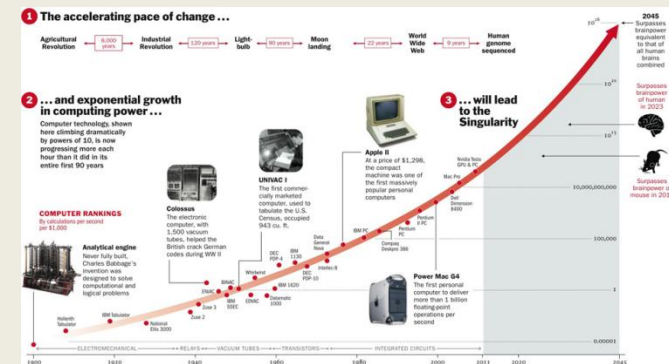
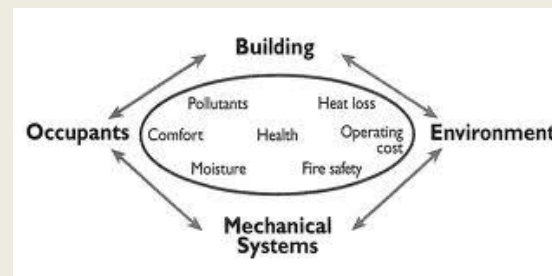
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Commercial Passivhaus Ready, Steady, GO!



PHPP 2007



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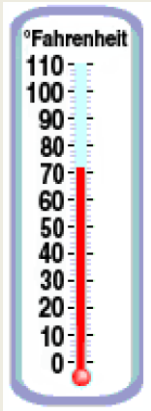
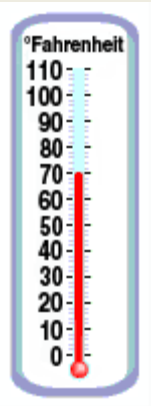
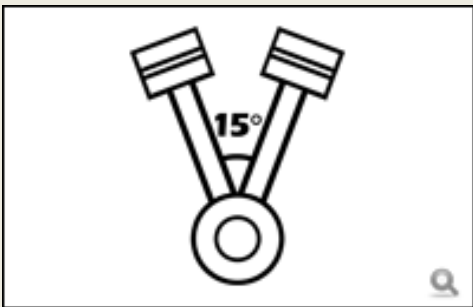
Commercial Passivhaus Ready, **Steady**, GO!



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Commercial Passivhaus Imperatives



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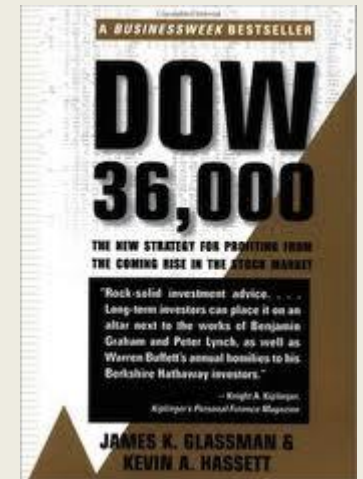
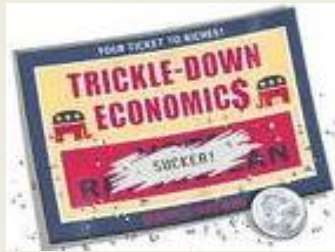
Non calor sed
umor est qui nobis
incommodat.



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